

Chapter 4

Lake Superior Critical Pollutants Progress Report

Insert at beginning of LaMP 2000 Chapter 4. This chapter will be updated in 2005 for inclusion in the LaMP 2006 report.



Burn Barrel
Photo by EcoSuperior.com

Lake Superior Lakewide Management Plan
2004

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CHEMICAL COMMITTEE WORKPLAN OVERVIEW 2004 TO 2006

The Chemical committee LaMP 2004-2006 workplan will be available in May 2004. Below are themes that the committee anticipates to be areas of activity for the next two years. The workplan will contain details regarding specific activities and jurisdictions.

- **Programmatic:** Agencies will continue to implement the activities identified in LaMP 2000. In 2005, the agencies will prepare a report that will evaluate the effectiveness of these activities in meeting the 2005 milestones and update the chemical reduction strategies to address future milestones.
- **Funding:** Lake Superior Binational Program agencies will pursue funding to continue successful pollution prevention projects and initiate pilot projects in the basin. Great Lakes funding programs are crucial funding sources for projects that carry out the zero discharge demonstration for Lake Superior.
- **Advocacy:** Implementation of LaMP projects has been beneficial to stakeholders within the Lake Superior basin and beyond. The challenge for agencies is to advocate this benefit to decision makers and the public to ensure continued support for toxic chemical reduction activities.
- **Outreach:** Agencies will continue communication and outreach activities that will achieve measurable progress toward the Binational Program goal of zero discharge for nine critical pollutants.
- **Contaminated Sediments:** Efforts leading to sediment remediation will continue in both countries. U.S. programs include the federal Superfund program and state contaminated sediment clean up programs. The U.S. federal Great Lakes Legacy Act funding will be available for the first time in 2004 for contaminated sediment remediation in Areas of Concern. In Canada, the process of conducting sediment assessments, selecting remediation options, and making funding decisions is underway for three Lake Superior AOCs.
- **Stormwater Management:** This will continue to be an important focus for several communities and government agencies. Stormwater controls will help prevent loadings of polynuclear aromatic hydrocarbons (PAHs) and heavy metals to the waters of the Lake Superior basin. Public education will be a critical element of the stormwater projects in the basin.

Chapter 4

Lake Superior Critical Pollutants Progress Report

This report provides an update of activities related to critical pollutants in the Lake Superior basin. It is organized to provide background on the program and to report agency activities related to critical pollutants between 2002 and 2004.

4.0 THE ZERO DISCHARGE DEMONSTRATION PROGRAM

Reducing toxics loadings to Lake Superior is a key component of the effort to achieve sustainability in the basin. The LaMP Stage 2 sets a goal of eliminating sources of the nine critical pollutants in the Lake Superior basin by 2020, with interim targets in 2000, 2005, 2010 and 2015 (Table 1). The baseline for the reduction targets is 1990. The Lake Superior Binational Program’s Zero Discharge Demonstration Program (ZDDP) is a unique experimental program intended to end the use of these nine critical pollutants in industrial processes or products and to prevent their release in the Lake Superior Basin.



Lake Superior Canadian north shore at Marathon, Ontario
Photo by John Marsden, Environment Canada

Table 1. Lake Superior Load Reduction Schedule
(percentage reductions)

Chemical	2000	2005	2010	2015	2020
Mercury	60	--	80	--	100
PCBs	33	60	95	--	100
Dioxin, HCB, OCS	--	80	--	90	100
Pesticides: Aldrin/Dieldrin Chlordane DDT/DDE Toxaphene	100	--	--	--	--

Why Zero Discharge for Lake Superior?

Lake Superior provides the best opportunity among the Great Lakes to achieve zero discharge. The governments around Lake Superior announced the Binational Program to Restore and Protect the Lake Superior basin in 1991, with an agreement to work together on the zero discharge demonstration and on broader ecosystem issues. The

1991 agreement stresses voluntary pollution prevention, but acknowledges that enhanced mandatory controls may be necessary.

Other Lake Superior Critical Pollutants

Although the load reduction schedules apply only to the pollutants targeted in the zero discharge demonstration, the LaMP Stages 1 and 2 identify other critical pollutants of lakewide concern for Lake Superior (“lakewide remediation” pollutants). The LaMP goal for lakewide remediation pollutants is to reduce inputs or remediate contaminants so that beneficial uses are restored. These pollutants include polynuclear aromatic hydrocarbons (PAHs), Alpha-BHC, Cadmium, Heptachlor/heptachlor epoxide, and dioxin and furan congeners expressed as toxic equivalents (with the exception of 2,3,7,8-TCDD, which is a zero discharge pollutant). Section 4.2.5 of this chapter discusses recent actions to reduce lakewide remediation pollutants from contaminated sediment and stormwater runoff.

Reducing Pollutant Concentrations in the Environment

Enforcement of strong environmental regulations, changes in industrial development patterns, implementation of pollution prevention, and the efforts of individual citizens have significantly reduced releases to the lake. However, the goal of zero discharge is a challenging one, and a significant amount of work remains to be done.

The ZDDP and other programs reduce toxic chemicals at their sources and result in their eventual reduction in the ecosystem. Concentrations of a suite of toxic organic contaminants in water including the Lake Superior critical and lakewide remediation pollutants declined more than 50 percent between 1986-87 and 1996-97. Nevertheless, of the nine critical pollutants, dieldrin, mercury, PCBs and toxaphene concentrations in Lake Superior continue to exceed the most stringent water quality standards.^{1,2}

Herring Gull eggs have been collected and analyzed annually from the same two Lake Superior sites since 1974 for selected contaminants. The annual data from 1974 to 2002 were analyzed by change point regression.³ In summary, 64.3% of contaminant-colony comparisons are declining as fast as or faster now than they were earlier in the study, while 28.6% have declined more slowly in recent years (see Appendix A).

In terms of spatial patterns among the 15 Herring Gull annual monitoring sites from throughout the Great Lakes, data for 1998 to 2002 show that for dieldrin and heptachlor epoxide, gull eggs from both Granite Island and Agawa Rocks on Lake Superior were among the most contaminated sites. The site ranked 3rd and 4th most contaminated, respectively (see Appendix A). DDE, HCB, PCB, TCDD and Hg values from the two sites did not differ from sites whose values were in the lower half of the overall range.

¹ Open Lake Monitoring Program, Environment Canada, 2000.

² Rolfhus, K.R., H.E. Sakamoto, L.B. Cleckner, R.W. Stoor, C.L. Babiarz, R.C. Back, H. Manolopoulos and J.P. Hurley. 2003. The distribution of mercury in Lake Superior. *Environmental Science and Technology*. 37(5): 865-872.

³ Pekarik and Weseloh. 1998

The Ontario Sport Fish Contaminant Monitoring Program reports toxaphene, PCBs and mercury cause 97% of consumption restrictions in Ontario Lake Superior sport fish. Since 1976 PCB concentrations in 55 cm lake trout have decreased by 82% and now average 195 ppb (compares with the 500ppb consumption guideline). Over the same period, mercury concentrations have dropped by 64% to an average of 0.19 ppm (compares with 0.45 ppm consumption guideline). Since 1981, toxaphene levels have declined by 59% to an average of 227 ppb (compares with 201 ppb consumption guideline). As a result, toxaphene remains the major cause of Ontario consumption restrictions on Lake Superior sport fish. Between 1997 and 2003, the proportion of Lake Superior sport fish with consumption restrictions has fallen from 41.9% to 25.8%, almost entirely because of declining toxaphene levels.

The number and geographic extent of sport fish consumption advisories in Lake Superior is expected to decrease as contaminant concentrations decline. However, the ecosystem requires decades to purify itself, and agencies will likely continue to issue sport fish advisories for some time.

Progress on pollutant reductions requires actions on many levels—local, state, provincial, federal, and tribal governments, industrial facilities, trade associations and individuals must all support the effort. Actions taken by all these groups have successfully reduced the critical pollutants in the Lake Superior basin, but more needs to be done.

Activities to Meet the Zero Discharge Goal

The efforts to reduce releases of the nine critical pollutants are increasing as governments and citizens work to identify creative ways to reduce the use and discharge of these chemicals. Much progress has been made through changes in industrial activity and through efforts by municipalities of all sizes and community-based programs. While these have been successful, there is also a need to address pollution sources from outside the basin.

Great Lakes Binational Toxics Strategy – The Great Lakes Binational Virtual Elimination Strategy (BTS) has had many successes in seeking Virtual Elimination of targeted toxic substances. For the latest update, please see their web site at www.epa.gov/glnpo.

Recent Municipal Activities

There are numerous activities undertaken each year by municipalities in the basin to reduce pollutants. Below are two noteworthy examples.

Sault Ste. Marie Household Hazardous Waste Collection Facility

The City of Sault Ste. Marie and Chippewa County in Michigan carried out special household hazardous waste collections (HHW) in 1998 and 1999. After collecting over 13,600 kilograms (30,000 pounds) of HHW, it was evident that there was a need for these services. The partners, including the city, county, Northern Transitions Inc., Lake Superior State University and Waste Management Inc., are working to establish a permanent collection site.

City of Thunder Bay

The City of Thunder Bay is undertaking a comprehensive \$97 million (Canadian) Pollution Prevention Control Plan (2003-2007). With \$25 million in support from the federal government, the infrastructure program includes construction of the new secondary sewage treatment plant (\$55M), further enhancement of sewage treatment processes to eliminate ammonia from the treated effluent (\$9M) and to change disinfection to UV radiation (\$6M). Other improvements include continuation of the storm water separation program (\$5M), and rehabilitation of sanitary sewers to reduce infiltration of ground water into the Sanitary Sewer System (\$11M). The extended Plan has been endorsed by all levels of government and by numerous community groups.

National and International Activities

National and international programs have an important role in protecting Lake Superior from inputs of critical pollutants, by reducing releases both within the basin and, in the case of pollutants that are atmospherically-transported long distances, beyond the basin. With its large surface area, Lake Superior receives a relatively high deposition of airborne toxics from distant and local sources.

In 2001, the United States and Canada became signatories to the Stockholm Convention on Persistent Organic Pollutants (POPs), which restricts the global production and use of twelve chemicals, including the Lake Superior critical pollutants PCBs, dioxin, hexachlorobenzene (HCB), and the pesticides chlordane, DDT, dieldrin, and toxaphene. Canada has ratified this treaty and, in the United States, the Senate Public Works and Environment Committee has recommended ratification. The Convention comes into force in 2004. In addition, both nations are participating in the Mercury Programme of the United Nations Environment Program, which has urged all countries to adopt goals and take actions, as appropriate, to identify populations at risk and to reduce human-generated releases.

At the national level, both countries have implemented actions to reduce air emissions of mercury, dioxin, HCB, and B(a)P. In addition, both countries are pursuing reductions of use and/or release of these substances and PCBs under the Great Lakes Binational Toxics Strategy, through voluntary agreements and information sharing about cost-effective reduction opportunities for state and local governments, industry, and non-government organizations. The Binational Household Garbage Burning Strategy was piloted in the Lake Superior basin. It will now serve as a model for other regions of both countries.

Air Emissions Regulations and Standards

Most significantly, regulation of municipal waste, hospital waste, hazardous waste, and sludge incinerators is yielding significant reductions in air emissions of mercury and dioxins. In Canada, the Ontario government amended the *Existing Hospitals Regulation* (Ontario Regulation 323/02) requiring all existing hospital incinerators to be closed by December 2003. Hospital incinerators were estimated to be the 13th largest emitters of mercury and the largest emitters of dioxins in Ontario. Once these closures are complete,

open burning of household waste will be the largest dioxin source category in the province. A proposed Canada-wide Standard for conical waste combustors has implications for Lake Superior. The standard would prevent the use of new conical waste combustors in Canada.

In the United States, control standards for small municipal waste combustors were finalized, and compliance is already required at large municipal waste combustors, hospital incinerators, and hazardous waste combustors. The amount of dioxin emissions reductions achieved at large municipal waste combustion units between 1990 and 2000 is 99%+. Also in the United States, mercury reduction requirements have been finalized in the last two years for mercury cell chlor-alkali plants and iron foundries, and proposed for industrial boilers.

The U.S. EPA has proposed regulations to reduce mercury emissions from coal-fired electric utility boilers, the largest source of mercury emissions in the United States. The proposal includes two primary regulatory alternatives. The first is a control technology standard that would achieve 29 percent reduction in mercury emissions by 2009. Under this option, U.S. EPA would impose emission rate limits on individual boilers in pounds per megawatt hour of electricity generated. The other option is a two phase "cap-and-trade" program, ultimately resulting in emissions reductions of 69 percent. This program would be implemented through state plans, under which states would receive mercury emissions "budgets" that they could meet either by setting emissions limits on individual boilers or by distributing mercury emissions allowances. These allowances could be traded with other sources across the country or banked for future use. The first phase of reductions would begin in 2010, with the final phase in 2018.

A Canada-wide Standard is also being developed for coal-fired power plants. The Canadian Council of Ministers of the Environment (CCME) committed in 2003 to set a Canada-wide Standard in 2005 to reduce mercury emissions from the coal-fired electric power generation sector by 2010. A 60 to 90% capture rate of mercury from coal burned is being considered nationally.

In addition, the CCME has agreed to initial actions by 2005 to reduce emissions from residential wood-burning appliances by updating standards for new wood-burning appliances, and exploring options for a national regulation and a change-out program. These measures would reduce HCB and B(a)P emissions. A U.S. regulation limiting emissions from hydrochloric acid production, finalized in 2003, is expected to reduce emissions of HCB.

Other Significant Regulations

In Ontario, *Regulation 196/03* came into effect in November 2003 requiring that all dental offices, in which dental amalgam is placed, repaired or removed, have a properly installed dental amalgam separator. The Royal College of Dental Surgeons of Ontario administers the regulation. In support of the regulation, the College has prepared a "Standard of Practice for the Profession" guide for the disposal of dental amalgam and mercury wastes. The separators are required to meet or exceed the ISO standard for these devices.

Wisconsin drafted regulations to reduce mercury air emissions from utilities and other large sources in the state. The effort began in 2000 with petitions by citizens and environmental organizations. After considerable work with the public and industry, the Wisconsin Department of Natural Resources Board adopted mercury emission regulations in 2003. However the regulatory package did not receive endorsement by the Wisconsin legislature and hence was not enacted. Although the rule-making was controversial, the rationale recognized the severity of the mercury problem state-wide and recognized a state regulatory role in addition to potential federal actions.

4.1 LaMP STRATEGIES

The LaMP 2000 report and the work of the committee are built around 23 pollutant reduction strategies. These will be reviewed and updated for the LaMP Chemical Milestone Report to be drafted in 2005. Fulfillment of the actions associated with the strategies will bring us closer to 2005 and 2010 milestones.

Table 2. Chemical Strategies

MERCURY

- Mercury Strategy 1: Encourage voluntary reductions of the use, discharge and emission of mercury.
- Mercury Strategy 2: Develop incentives to reduce mercury use.
- Mercury Strategy 3: The mining and electric utility sectors must reduce mercury by half in order to meet the 2010 milestone.
- Mercury Strategy 4: Mercury-bearing products must be reduced in order to halve the amount of mercury in products by 2010.
- Mercury Strategy 5: Proper identification, collection and disposal of mercury-bearing products in the basin.
- Mercury Strategy 6: Regulations, compliance, and enforcement.
- Mercury Strategy 7: Remediation of mercury contaminated sediments.

PCBs

- PCBs Strategy 1: Encourage voluntary reductions of the use and storage of PCBs.
- PCBs Strategy 2: Untested equipment must be tested and the inventory must be kept current.
- PCBs Strategy 3: Decommissioning, removal and destruction of PCBs.
- PCBs Strategy 4: Government agencies to undertake PCB training programs.

PESTICIDES

- Pesticides Strategy 1: Collection of remaining stockpiles of banned pesticides.
- Pesticides Strategy 2: Engage other programs that deal with banned pesticides.
- Pesticides Strategy 3: Educate residents about the use of pesticides.

DIOXIN, HCB, OCS

- Dioxin Strategy 1: Encourage voluntary reductions of the discharge and emission of dioxin/HCB/OCS.
- Dioxin Strategy 2: Develop incentives to reduce dioxin/HCB/OCS.
- Dioxin Strategy 3: Pollution prevention is the preferred approach to inhibit the formation of dioxin/HCB/OCS in incineration.
- Dioxin Strategy 4: There is a continuing role for the pulp and paper industry to play in dioxin reductions.
- Dioxin Strategy 5: Identify sources of dioxin/HCB/OCS.

STRATEGIES THAT APPLY TO MULTIPLE POLLUTANTS

- General Strategy 1: Lake Superior goals must be taken into account by other programs.
- General Strategy 2: Sites contaminated by the nine designated chemicals must be identified and cleaned up.
- General Strategy 3: Pollution prevention is the preferred approach to achieving the goal of zero discharge.
- General Strategy 4: Lake Superior communities must be supported in their pursuit of the zero discharge demonstration program and encouraged to share their expertise to help others protect the lake.

4.2 LaMP ACCOMPLISHMENTS 2002 TO 2004

Actions undertaken or completed since the release of the LaMP 2002 report are summarized below. Actions not reported in the 2002 update are also presented here.

4.2.1 Mercury Strategies and Related Activities

Voluntary programs for mercury reduction in the basin range from national programs, to those that apply in a particular jurisdiction, to very specific voluntary reductions. Some examples of voluntary reduction programs include the following:

- The Minnesota Dental Association, in conjunction with Metropolitan Council Environmental Services, kicked off a statewide effort in 2003 to encourage voluntary installation of amalgam separators in all dental offices statewide by 2005. More than 1,100 dentists have signed up already.
- In Ontario, EcoSuperior (a Thunder Bay non-profit organization), and the Clean Air Foundation (with funding from Ontario Ministry of the Environment, Environment Canada and Ontario Power Generation) have set up a program to recover mercury switches from automobiles. To date EcoSuperior has collected 1,340 switches diverting more than 1 kilogram of mercury destined for steel making and release to the atmosphere from blast furnaces. The program currently involves nine auto companies in Thunder Bay, Marathon and Sault Ste. Marie. Fluorescent Lamp Recyclers collects the mercury switches reclaimed from automobiles in this program.

- Initially coordinated by EcoSuperior, regional industries and public sector establishments have set up a voluntary fluorescent lamp recycling and disposal program for large scale operations using Fluorescent Lamp Recyclers, Inc. Recently MGM Electric Limited in Thunder Bay has set up a fluorescent recycling program for the commercial sector. Bulbs are collected at MGM on a "pay as you go" basis.
- In 2002, EcoSuperior set up a month-long fluorescent light collection event for Thunder Bay homeowners and small business. This event has been expanded so that in 2004 the event will run for several months and will include depots in both Thunder Bay and Wawa open to homeowners and small business. Support for fluorescent light recycling is provided by Ontario Power Generation, the Great Lakes Sustainability Fund and the Ontario Ministry of Environment.
- Taken together the fluorescent tube collection programs in the Ontario portion of the basin recover approximately 500 grams of mercury annually (based on 20 mg mercury vapour per lamp).
- In Wisconsin, the City of Superior set up a fluorescent bulb recycling program where local hardware stores provide collection facilities and local industries (Murphy Oil USA and Superior Water Light and Power) provide funds for bulb recycling.
- The Murphy Oil refinery and City of Superior received EPA GLNPO funding to develop a plan to eliminate the use of mercury and PCB containing equipment at the refinery. The project includes development of a purchasing policy and project outreach that can be used by other industrial facilities.
- Algoma Steel Inc. in Sault Ste. Marie, having previously sent its in-storage mercury for recycling has agreed to no accumulation of new mercury inventories and has put in place a direct removal policy.



It is possible to reduce mercury in the *utility and mining sectors* through the use of new technology and changes in patterns of energy consumption. Cost-effective pollution control technologies are under exploration for coal-fired power plants and may be applicable for some mining technologies. A new gold mining technology is already in place and taconite processing is being studied for potential mercury reductions.

- In late 2002, the Golden Giant Mine in Manitouwadge, Ontario introduced a new processing technology that uses an Australian designed "Acacia" reactor. This is the first installation in North America for this type of process that allows on-site low temperature treatment of gravity recovered gold rather than

off-site high temperature smelting. The process includes removing mercury as mercury sulphide (cinnabar). Besides the economic benefits resulting from the on-site processing of gravity gold, there are environmental benefits. Previous gravity gold shipments resulted in 200 kilograms of contained mercury being shipped off-site each year. The new process reduces these off-site shipments by over 90%. All of the contained mercury in the “Acacia” reactor is removed as an amorphous mercury sulphide (cinnabar) precipitate and is stored with similar sulphide bearing tailings material within the tailings management area.

- The Minnesota Department of Natural Resources Minerals Division finished a report in 2003 for the Minnesota Pollution Control Agency regarding scrubber water from taconite processing. Samples were taken from four taconite processing plants. Although the data were variable, the researchers believe these variations imply relationships between processing technique and mercury recovery.

While new technologies are being developed that limit mercury emissions, *energy conservation and alternative energy sources* are important options for the basin. The LaMP 2002 noted a variety of national energy regulations that are in the development stage. Energy related initiatives in the basin since 2002 include the following:

- The Ontario government has committed increasing the share of "renewables" in the Ontario power mix by 10 percent or 2700MW by 2010 with a five percent target of 1350 MW by 2007.
- Pending the outcome of an environmental assessment under the Canadian Environmental Assessment Act, Superior Wind Energy Inc. is proposing to construct a low-density wind park on forested land in the District of Algoma north of Sault Ste. Marie. The project is in two phases of 100MW each using 55 wind turbine generators. The project is expected to begin in 2005 with a cost estimated of \$180 million (Canadian).
- In Duluth, Minnesota, the new Hartley Nature Center will be nearly energy self sufficient. Solar panels cover the roof, passive heat and lighting was incorporated in the design and a geothermal heat pump is the primary heating and cooling system. In addition, the building will use no polyvinyl chloride and wood siding for the structure was purchased from Minnesota forests that have been designated as sustainable by the Forest Stewardship Council.
- The Duluth Zoo was the first Northeastern Minnesota recipient of a Rebuild Minnesota grant. The \$300,000 (US) renewable energy demonstration program includes installation of some cutting-edge technology including solar hot water and eventually space heating equipment for the animal barn; photovoltaic cells to charge electric vehicles; and a geothermal heat exchanger that uses the earth's crust to cool polar bear and seal pools. The new

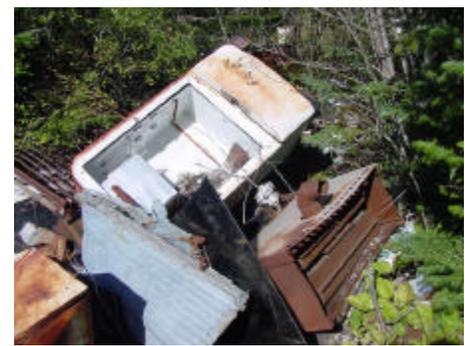
equipment is projected to trim about \$136,000 (US) from the zoo's annual energy bills.

- Grand Portage Reservation received results from its anemometer study and is continuing to pursue wind as an energy source. Bad River and Bay Mills Reservations are assessing the feasibility of developing wind generation.
- Minnesota Power constructed an innovative, high-efficiency home in a northern climate with a goal of heating it for \$300 (US) or less per year in Duluth, Minnesota. The Millennium Star house incorporated energy efficient design, materials and appliances. Information about the project is available on the web at <http://www.mnpower.com/energyhome>.

The strategy for *mercury bearing products* organizes actions for citizens to reduce the use of mercury containing devices and promotes the use of alternative products and proper disposal of mercury containing devices. As in LaMP 2002, mercury collection projects continue in the basin. Some actions that have taken place since 2002 include the following:

- Auto switch programs have been implemented in several communities in the US and Canada. In Wisconsin, Wisconsin Indianhead Technical College and the City of Superior sponsored an auto switch-the-switch event. Approximately 60 cars were checked by the students from the mechanical program and 38 mercury switches were replaced. The Cities of Superior and Ashland set up a program with auto dealers to replace mercury switches in vehicles before they leave the lots. The auto dealers display posters and flyers advertising their participation.
- Bad River Reservation carried out an abandoned car program to survey abandoned cars; remove their switches, fluids and batteries; and develop an abandoned car ordinance.
- EcoSuperior has established collection depots in Thunder Bay, Nipigon, Schreiber, Terrace Bay, White River and Sault Ste. Marie for thermostats. Collected thermostats are sent to a processor where mercury is removed and sent to Honeywell Inc. for re-use in new products. The project has collected approximately 500 grams of mercury. In the U.S. a program sponsored by Honeywell and WDNR established eight industrial supply businesses in Duluth and Superior as permanent collection depots for mercury containing thermostats from contractors and builders. Participating businesses are recognized with certificates.
- The City of Floodwood, MN also experimented with a thermostat swap. The city, population of 487, collected 113 mercury thermostats (about 300 grams of mercury).

- The Minnesota Pollution Control Agency purchased some mercury free thermostats for a thermostat swap project that is under development.
- In 2003, the Minnesota Pollution Control Agency purchased 30 amalgam separators for use by dentists who do not yet have one. Nineteen have been distributed to date.
- Mercury thermometer collections and swaps were implemented in Thunder Bay, Nipigon, Terrace Bay, Marathon, Wawa and Sault Ste. Marie, Ontario; Buhl, Floodwood, Hibbing and Hoyt Lakes, Minnesota. In many cases outreach materials were available to the public. In the Wisconsin portion of the basin, over 8,000 mercury thermometers have been collected since 2000.
- The City of Buhl, Minnesota used Minnesota Pollution Control Agency funding to purchase sodium vapour security lighting to replace the old mercury vapour lamps.
- Abandoned waste collections were carried out by Lake County and St. Louis County in Minnesota using USEPA funding. About 55 tons of trash was hauled out of the woods and recycled or landfilled. Similar collections were also carried out by recreational groups in Wisconsin and Minnesota. White goods can contain mercury switches and PCB ballasts or capacitors.
- White goods are now collected at Thunder Bay landfills. To make use of this service, citizens must have the freon gas removed and the appliance tagged. Abandoned appliances are collected separately and drained by a contractor. The mercury-containing switches are removed by a contractor (Lakehead Scrap Metals) before the metal appliances are shredded.
- Periodic curbside white goods collections have been carried out at Grand Portage and Fond du Lac Reservations.
- The City of Thunder Bay has partnered with EcoSuperior to divert mercury bearing products from reaching landfills. Collected products include button batteries, fluorescent lights and thermostats.



Abandoned white goods, Minnesota
Photo by Hank Fisher, Minnesota Office of
Environmental Assistance

There has been significant *activity to inform the public* on the hazards of exposure to elemental mercury and how to recognize and properly dispose of mercury bearing products. In many cases, alternative products are now available to the public. The Lake Superior Binational Forum has been involved in a number of mercury reduction

activities. (For a description of the Forum's Chemical Committee's activities, see Appendix A.) Recent projects in the basin include the following:

- Minnesota's *Mercury Free Zone* has spread statewide. As of September 2003, 284 kilograms (625 pounds) of mercury has been removed from schools; 238 out of the 1,800 schools have signed the mercury free pledge; Minnesota Pollution Control Agency staff and Clancy (the mercury detecting dog) have assessed 96 schools for mercury contamination; and they have educated at least 9,418 students, teachers and school faculty.
- The Northwest Wisconsin Mercury Free Schools program has reached 85 schools. City of Superior staff presents programs to all age school groups. Schools pledge to remove mercury products and elemental mercury. The program includes technical assistance and facility audits. Northwest Wisconsin Regional Planning Commission collects the mercury devices and other hazardous waste. Thousands of mercury items and hundreds of pounds of mercury have been collected through this program.
- The St. Louis Riverwatch Mercury Curriculum was completed and distributed in September 2003. It was written by eleven educators and related professionals from Minnesota.
- The Lake Superior Binational Program sponsored a workshop in Thunder Bay in June 2003. Entitled *Mercury in Our Lives: A Workshop on Mercury reduction for the Lake Superior Community*, the workshop featured speakers on human health issues, the mercury inventory of Lake Superior sources and a variety of mercury reduction activities, including both the municipal sector and the industrial and commercial sectors.
- Environment Canada and Ontario Ministry of the Environment have worked with a group of stakeholders including Dental and Dental Hygienists Associations, universities and colleges, the City of Toronto and the Royal College of Dental Surgeons to develop a Best Management Practices manual. Now available for the dental community, the manual covers procedures for collection and disposal of dental wastes including mercury.
- Similarly, the City of Superior offered Dental Office Best Management Practices workshops to all Douglas County dentists. City of Superior and City of Ashland pollution prevention project staff have now visited most of the



Household hazardous waste collection event in Manitowadge, Ontario
Photo by Jim Bailey, EcoSuperior

dental offices in the basin in Wisconsin to present training in best management practices.

- Wisconsin Department of Natural Resources produced a 16-page Lake Superior article for the Wisconsin Natural Resources magazine.
- The Lake Superior Binational Program prepared a poster for the 2003 International Joint Commission mercury workshop which included a timeline of progress since 1990 and some of the significant events that drove concerns about the effect of mercury on human health.
- The Minnesota Pollution Control Agency printed mercury and PCB “use tree” posters for basinwide use. These posters illustrate the various ways in which mercury and PCBs have been used and update the use trees depicted in the Stage 2 LaMP.
- Wisconsin agencies and individuals developed and produced poster displays on Lake Superior issues including mercury and burn barrels. The posters were used at county fair displays during the summer of 2002 and are placed in several locations including the Northern Great Lakes Visitor Center.
- The Red Cliff Band of Lake Superior Chippewa has hired a mercury elimination coordinator to work with the community on mercury reduction and burn barrel projects. A June 2003 community workshop kicked off the project, which includes a radio show that combines music and environmental messages on the Red Cliff radio station.

Although mercury reduction activities are important, *monitoring* to assess progress on the Zero Discharge Demonstration and track the levels of mercury in the environment is vital. Current mercury monitoring activities in the basin include the following:

- Ontario Power Generation has implemented a voluntary coal, ash and flue gas sampling and analysis program to support development of the Canada Wide Standard for mercury emissions from coal-fired power plants.
- Red Cliff Reservation has a Surface Water Quality Monitoring Program which tests 21 different locations on the reservation for 22 different parameters including mercury, dioxin 2,3,7,8-TCDD, PCBs, toxaphene, and chlordane. Keweenaw Bay, Grand Portage, Fond du Lac, and Bad River Reservations currently have in place or are developing similar surface water quality monitoring programs.
- In 2003, Western Lake Superior Sanitary District sampled the St. Louis River (11 sites) and four Duluth streams for mercury, dissolved mercury, methyl mercury, and a number of other parameters that usually correlate with mercury concentrations in water. The sample locations also included three tributaries.

- Fond du Lac Reservation conducted a second sediment assessment project funded through GLNPO, sampling St. Louis River sediments and expanding the sediment quality database (particle size, percent solids, loss on ignition, total mercury, methyl mercury, lead, PCBs, toxicity tests).
- Researchers from the University of Wisconsin in LaCrosse and Madison as well as Lake Superior University in Michigan, examined the distribution and fluxes of total and methyl mercury in Lake Superior. They found low concentrations of total mercury (about 0.5 ng/L) in the open waters.
- In Minnesota and Wisconsin, fish consumption advice changed in 2002 so that instead of keeping all coho at the one meal per week level, the less than 18 inch coho are now unlimited and the larger than 18 inch coho are one meal per week. In 2003, the size cut-off for going from one meal per week to one meal per month for chinook went from 22 inches in 2002 to 25 inches in 2003. Lake herring advice changed from unlimited to all sizes one meal per week. The advice is based on both PCB and mercury levels.
- Michigan evaluated fish tissue data and removed the consumption advisory for mercury in ciscowet lake trout although the levels are still too high for chlordane, PCBs and dioxin.
- There have been no changes to the number of sport fish consumption advisories issued in Ontario based on mercury concentrations in fish caught in Lake Superior.
- The Great Lakes Indian Fish and Wildlife Commission drafted a summary of chemical contamination in Lake Superior for the Great Lakes Fishery Commission State of Lake Superior Conference report.
- Temporal and spatial trends of mercury in fish from Lake Superior are being evaluated. Mercury was recently added to the list of analytes measured as part of the GLNPO trend monitoring program. Results of ongoing studies of fish from the Apostle Islands in Wisconsin will also be evaluated for mercury trends.
- The Town of Delta in Bayfield County, Wisconsin received a Wisconsin Great Lakes Protection Fund grant to investigate mercury levels in soil at their abandoned town dump. The Town also hired a contractor to develop an erosion control plan at the site, which sits on a tributary to Lake Superior.
- As of 2004, Bad River Reservation will be monitoring for total and methyl mercury in wet precipitation as part of its ongoing total suspended particulate (TSP) monitoring.

Regulations for the release, control and management of mercury and mercury bearing products are in place in all Lake Superior jurisdictions. New regulations since 2002 are listed below:

- Ontario *Regulation 196/03* came into effect in November 2003 requiring that all dental offices, in which dental amalgam is placed, repaired or removed to have a properly installed dental amalgam separator. The separators are required to meet or exceed the ISO standard for these devices.
- In late 2002 Ashland, Wisconsin passed an ordinance banning the sale of products containing over 50 mg of mercury (with the exception of dental amalgam). The ban does not apply to fluorescent lights since they contain less than 50 mg mercury. Ashland's ordinance also requires mercury-containing devices to be removed from buildings prior to demolition. Superior, WI banned fluorescent lights from landfills in 2002. The City and Douglas County had banned the sale of mercury thermometers in 2001.

4.2.2 PCB Strategies and Related Activities

A variety of voluntary PCB reduction activities in the Great Lakes and Lake Superior have already taken place or are underway. Due to the technical differences in reporting PCB use and storage between Canada and the United States, a binational inventory is not feasible at this time. Reduction data will be reported separately in the forthcoming LaMP 2005 Chemical Milestone report.

Revised Regulations for chlorophenol use and PCB storage in Canada are targeted for publication in 2004. Strict phase-out dates for PCBs are proposed as follows:

- high level (>500 ppm) in-use PCBs by the end of 2007;
- low level (50-500 ppm) PCBs in-use by 2014;
- all PCBs in storage by the end of 2009 and allow in-use PCBs to be transferred to storage for only one year or less;
- all PCBs in sensitive locations within three years of the regulation coming into force; and
- decontamination of all out of service liquids containing less than 2 ppm (the current limit is 50 ppm).

In Ontario, PCB phase-out activities are proceeding in advance of the federal regulations:

- A canvass of seven pulp and paper mills on the north shore of Lake Superior revealed that three mills (Marathon Pulp, Smurfit Stone and Norampac) are entirely PCB-free and the remaining four are phasing out their in-use and in-storage PCBs.
- Algoma Steel Inc. in Sault Ste. Marie, under its Environmental Management Agreement has destroyed 83 percent of its PCB inventory including 100 percent of bulk liquids, 98 percent of capacitors in storage and 50 percent of transformer carcasses.

- In the past three years the City of Thunder Bay has removed and destroyed 2,840 kilograms of PCB transformer oil and cleaning liquids together with 22,650 kilograms of PCB-containing capacitors and street-lighting ballasts. The city is now considered PCB-free.

In Minnesota, the MPCA has evaluated transformer inventories at several utilities in the basin. Inventories at one municipal utility and three rural electric cooperatives indicate roughly 700 transformers have a moderate to high risk of containing PCBs. The next phase of the project is to remove as many of the transformers as possible, starting with those that are closest to waterbodies.

Minnesota Power (MP) has removed all of its high-level PCBs except for two PCB capacitor banks, removing over 2500 PCB capacitors since 1994. The two remaining PCB capacitor banks are to be removed during the third quarter of 2004. MP had already removed all of its known PCB transformers and sources of PCB oil of 500 ppm. MP also continues to remove its PCB-contaminated oil in electrical equipment.

4.2.3 Dioxin, HCB, OCS Strategies and Related Activities

Since hexachlorobenzene (HCB) and octachlorostyrene (OCS) can be formed together with dioxin in combustion, these three substances are dealt with as a single group. Projects to identify and reduce sources of dioxin range in scope from an entire state or province to local efforts. Examples of dioxin activities since LaMP 2002 include the following:

- EcoSuperior continues a garbage-burning awareness campaign with the support of Environment Canada and the Ontario Ministry of the Environment. Phase 1 of the campaign was a workshop in 2002 hosted by the Lake Superior Binational Forum entitled *Burning Household Garbage: Impacts and Alternatives*. The workshop targeted a diverse group of individuals and agencies and received feedback on behaviors and alternatives regarding burning household garbage. Phase 2 has been a media campaign, outreach to schools, and presentations to community groups and elected politicians. Flyers, bags and tags have been produced for a Parks campaign to begin in 2004.
- Wisconsin Environmental Health Association and Wisconsin Department of Natural Resources (WDNR) produced the *Air Defenders: The Quest for Clean Air*, an educational program about open burning, air quality and asthma for children 10 years and older. The kit includes a CD of an interactive education game, posters, brochures, a WDNR video called *Give Burn Barrels the Boot* and a CD with music lyrics for songs such as *The Burn Barrel Blues*.



Logo for Lake Superior Canadian north shore household garbage burning campaign
Credit: EcoSuperior.com

- Western Lake Superior Sanitary District in Duluth, Minnesota conducted a second open burning survey, targeting local government officials in Minnesota, Wisconsin and Michigan.
- Superior, Wisconsin continues burn barrel outreach activities and Northwest Wisconsin Regional Planning Commission is developing a burn barrel education video for local officials.
- Environment Canada has conducted stack tests of various dioxin sources including two Kraft mill boilers in the basin (Norampac and Marathon) and crematoria and waste incinerators in other locations. Test results are pending and will be used in calculating the Lake Superior dioxin inventory.
- The Great Lakes Indian Fish and Wildlife Commission has an ongoing study that is collecting baseline dioxin and furan concentrations in common tribally harvested fish species from several locations in Lake Superior (lean lake trout, siscowet trout, lake whitefish, and lake herring).
- Red Cliff Reservation continued its Burn Barrel Elimination Program and to date has collected more than 100 burn barrels.
- Bad River Reservation expanded a burn barrel outreach effort, including the use of the new materials developed by the Wisconsin Environmental Decade and Wisconsin Department of Natural Resources.
- Grand Portage Reservation hired an air quality specialist to identify air quality issues and develop projects to minimize effects, including dioxin from burn barrels.
- Fond du Lac Reservation is beginning a burn barrel initiative.
- EcoSuperior is involved in local promotion of the national Burn-It Smart Campaign to reduce emissions from woodstoves and similar appliances.
- University of Wisconsin Lake Superior Research Institute has a project funded by U.S. EPA GLNPO to update the dioxin inventory for the Lake Superior basin.

4.2.4 Pesticide Strategies and Related Activities

Various jurisdictions in the basin continue to carry out “clean sweep” collections of remaining stockpiles of banned pesticides from farmers and commercial applicators and to educate residents about their proper disposal. Household hazardous waste collections also continue in the basin. In the United States, tribal governments continue to conduct household hazardous waste collection and education activities within reservation boundaries as well as in surrounding communities. The most recent pesticide collection under the Ontario Clean Sweep program was conducted in 2001. The provincial

government treats these materials as hazardous wastes and they are either disposed to a secure landfill or incinerated at approved facilities with the ash landfilled. Ontario remains committed to the program; however, this costly program is not conducted every year.

Collection activities include the following:

- Provincial and state waste pesticides collections continue. Table 3 shows the amounts collected since the LaMP 2002. The table also shows earlier data not previously reported by the LaMP. It should be pointed out that the pesticides targeted for zero discharge are still being found in the basin.

Table 3. Recent Waste Pesticides Collected in the Lake Superior Basin (kg)

Jurisdiction	Dates of Collection	Aldrin/ Dieldrin	Chlordane	DDT	Silvex/ 2-4D/ 2,4,5T	Toxaphene	Total Pesticides ¹
Michigan ²	9/02-10/03						434
Minnesota ³	1999-2003	28	241	752	4145	17	15,978
Ontario ⁴	2002-2003						599 kg of solids and 1348 litres of liquids
Wisconsin ⁵	1999-2003	0	39	36	89	0	8,682

¹ Total of all pesticides collected.

² Data from the Michigan Department of Agriculture compiled by the Michigan Department of Environmental Quality for counties in the Upper Peninsula.

³ Compiled by Minnesota Department of Agriculture Waste Pesticide Collection Program for Carlton, Cook, Lake and St. Louis Counties.

⁴ Data from municipal collections in Thunder Bay, Manitowadge and Marathon.

⁵ Data from the Northwest Wisconsin Regional Planning Commission compiled by the Wisconsin Department of Natural Resources for Ashland, Bayfield, Douglas and Iron Counties.

- In Wisconsin's part of the basin, collections for hazardous waste from households, small businesses, and agricultural operations is conducted through a mobile collection program operated by Northwest Wisconsin Regional Planning Commission. In 2002, the program expanded to provide "milk run" collections for small businesses to make proper disposal of hazardous waste more affordable in this rural area. The community based pollution prevention projects in the basin, including the Northwest Wisconsin Mercury Free Schools, utilize this collection program.
- In 2003, EcoSuperior held the first ever household hazardous waste collection collections in the towns of Marathon and Manitowadge. One hundred and sixty litres of pesticides were among the hazardous materials collected.
- Between 1999 and 2003, the City of Thunder Bay collected 599 kilograms of solid pesticides 2,236, litres of liquid pesticides, 118 kilograms of mercury

through its household hazardous waste program. During 2002 and 2003, 288 litres of pharmaceuticals were collected.

- Bad River Reservation is conducting an assessment of water, sediment and wild rice plant grains for residuals of the chemical treatment used for invasive species.
- Grand Portage Reservation is currently implementing a Pesticide Use Policy on the Reservation to help avoid unnecessary and unscrupulous spraying.

4.2.5 Contaminated Sediment and Stormwater: Sources of Lakewide Remediation Chemicals

In addition to the nine pollutants included in the Lake Superior Zero Discharge Demonstration Program, the LaMP process identified other critical pollutants for Lake Superior which impair beneficial uses or which are found at levels that exceed criteria set to protect the Lake's ecosystem. Although these critical pollutants are not slated for zero discharge and do not have associated load reduction targets, their LaMP management goal is pollutant reduction so that beneficial uses are restored.

“Lakewide remediation” is a category of critical pollutants which exceed criteria levels in the open lake or are found in several contaminated sediment locations around the basin. These chemicals also could pose a risk to Lake Superior based on their toxicity and other chemical properties. Three of the lakewide remediation pollutants: heptachlor, alpha-BHC and alpha endosulfan exceeded criteria in open lake waters. Sources of these pollutants are primarily long-range transport. Cadmium and Polynuclear Aromatic Hydrocarbons (PAHs) on the other hand, are lakewide remediation pollutants with sources in the basin. They are found in multiple contaminated sediment areas as well as in stormwater runoff. PAHs in particular cause multiple impacts in the Lake Superior basin. The presence of these pollutants in contaminated sediment and stormwater runoff is important to the Lake Superior ecosystem because they impact its most biologically productive region.

Lake Superior has a narrow rim (less than 5% of its area) of shallow nearshore area and embayments that comprise its most biologically productive area. Most species of Lake Superior fish use the nearshore waters for some critical life stages. The nearshore and embayments are the areas most impacted by contaminated sediment “hot spots” and by stormwater runoff carrying contaminants from industrial and developed areas.

Contaminated Sediment

Contaminated sediments are a concern in many of the Lake Superior Areas of Concern (AOCs) and several other areas of localized contaminated sediment and soils. Some of the zero discharge pollutants are found in Lake Superior AOC sediments. In addition, PAHs are a problem in some Lake Superior AOCs and at other sites. They are commonly found in relation to developed areas from street runoff and at higher concentrations in association with old industrial sites. Stormwater runoff from industrial

and commercial sources can serve as a source of PAH contamination to sediment. In the Lake Superior basin, concentrated areas of PAHs in sediment are mainly related to past dumping of industrial wastes from steelmaking, coking, petroleum refining and shipment, wood preserving, coal shipment, and coal gasification for “gas lights” in the late 1800s and early 1900s. Contaminated sediment activities since the LaMP 2002 include the following:

- In Thunder Bay Harbour the cleanup and remedial measures at the Northern Wood Preservers site have been completed. Approximately 13,000 m³ of creosote-contaminated sediment was dredged from the harbour areas around the Northern Wood Preservers site and treated off-site by thermal desorption. An additional 21,000 m³ of contaminated sediment was contained within the confines of a rockfill berm and capped with clean fill. The contaminant source was isolated using a steel sheet pile wall. Monitoring programs are now underway to assess that the barrier and groundwater control systems effectively prevent the remaining on-shore contaminants from moving toward Lake Superior. A naturalized buffer was created between the industrial site and the harbour. Studies will be undertaken in 2004 and in later years to document the changes in fish habitat and to assess natural recovery of low impacted sediment remaining outside of the rockfill berm.
- Wisconsin Department of Natural Resources (WDNR) removed 7500 cubic yards of PAH contaminated sediment and floodplain soils during the summer of 2003 from Newton Creek in the St. Louis River Area of Concern. Newton Creek flows through residential neighborhoods of Superior, WI into Hog Island Inlet of Superior Bay. Funding for this project was provided through the U.S. EPA Great Lakes National Program Office, Wisconsin Coastal Management Program, WDNR Harbors and Bays and Remediation programs. WDNR will seek funding to remediate contaminated sediment in Hog Island Inlet and restore this valuable shallow water and wetland habitat, which lies 1.5 miles from the confluence of the St. Louis River through Superior Bay to Lake Superior.
- The St. Louis River Citizens Action Committee is facilitating an updated contaminated sediment strategy focused on PAHs in the Area of Concern, coordinated between Wisconsin and Minnesota. Start-up funds are from the Wisconsin Department of Natural Resources.
- Under direction from the Minnesota Pollution Control Agency, the responsible party at the US Steel site in Duluth has recently completed two investigations of St. Louis River sediments. In March 2002, the Laser



Thunder Bay Harbour, Ontario
Credit: Patrick Morash, Ontario Ministry of Environment.

Induced Fluorescence tool was used through the ice to profile coal tar waste across 80 acres of sediments in Spirit Lake. Sediment samples were collected with a barge mounted geoprobe in September 2003 to confirm the Laser results against analytical results. The Agency will be evaluating this data in the next few months.

- One of the two federal Superfund sites in the St. Louis River Area of Concern, the former Interlake/Duluth Tar site, is nearing a Record of Decision between the Minnesota Pollution Control Agency and the responsible parties. Remedial operations (a combination of dredging and capping) should begin in spring 2004.
- Wisconsin Department of Natural Resources, U.S. EPA, and responsible parties continue to investigate the Ashland – Waterfront Superfund site in Ashland, Wisconsin. Groundwater contamination and PAH contaminated sediment in a ten-acre area of the Ashland waterfront result from historical operation of a coal gasification plant.
- The Minnesota Pollution Control Agency carried out a sediment remediation scoping project in Minnesota Slip using funding from U.S. EPA GLNPO. PAHs, PCBs, lead, mercury and zinc were analyzed and results showed contamination within the slip is heterogeneous. The greatest exceedance of sediment standards occurred with PAHs. An extensive sediment investigation was initiated in March 2004.
- The Minnesota Pollution Control Agency developed a GIS-based contaminated sediment database for the St. Louis River Area of Concern with funding from U.S. EPA GLNPO. Funds are being sought from the Wisconsin and Minnesota Coastal Management Programs to complete the project.
- In Ontario, federal and provincial officials are in the process of undertaking scientific reviews and considering management options for three Areas of Concern. At the Peninsula Harbour AOC, staff have assembled the necessary data on sediment conditions and will determine if there would be an overall environmental benefit from removing contaminated sediment from the harbour. At the Thunder Bay AOC, studies are underway adjacent to the Cascades Fine Papers Group Thunder Bay, Inc. to complete the sediment assessment and determine the need for remediation. At the St. Marys AOC a sediment management strategy is being developed.
- The Minnesota Coastal Program granted \$445,000 to the City of Duluth for remediation at the Sargent's Creek Dump Site. This is a clean-up project at a dumpsite on the banks of a tributary to the St. Louis River estuary.
- A coal tar site on the lake shore at Burlington Bay in Two Harbors, Minnesota is being investigated to determine the extent of PAH contamination. It is not certain yet if sediments are impacted.

- A Reserve Mining unpermitted landfill in Silver Bay, Minnesota contains over 1000 barrels of leaded grease that is considered hazardous waste. Some lead and other heavy metals were found in small creeks down gradient from the landfill. It has not been determined if the contamination has reached Lake Superior.
- PCBs were found in sediments of Kingsbury Creek near the DM&IR site in Proctor, Minnesota. Kingsbury Creek is a tributary of St. Louis River, although it is some distance from the lake.

The Lake Superior Stormwater Project

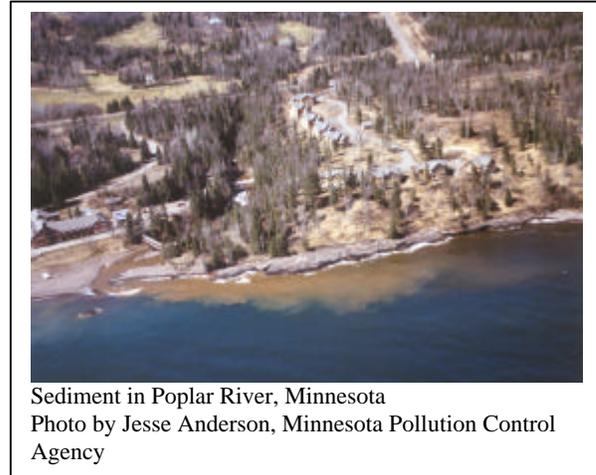
From 1993 to 1995, the Lake Superior Binational Program engaged in a project to investigate the importance of stormwater as a pollutant source in the Lake Superior basin. Most urban storm runoff was delivered to the lake untreated, by way of ditches and storm sewers that flow into the lake or to tributary streams. This project was a partnership of Wisconsin, Minnesota, Michigan, the U.S. Geological Service and U.S. Environmental Protection Agency. The project focused on municipalities with populations greater than 5,000: Superior, Ashland, and Hurley, Wisconsin; Duluth, Hibbing, Virginia, and Cloquet, Minnesota; Marquette, Houghton/Hancock, Ishpeming, Sault Ste. Marie, Negaunee and Ironwood, Michigan. Project staff estimated the amounts of stormwater pollutants entering Lake Superior, developed best-management practices for reducing contaminated runoff from bulk storage piles, conducted an information campaign about stormwater pollution, and assisted communities in stormwater planning. Samples of water from rain and melting snow were taken from streets, rooftops and storm sewers. Heavy metals and PAHs in storm sewers were typically at concentrations exceeding the allowable limits in point source discharges. Total loading of PAHs to the lake from storm sewers in urban areas on the U.S. side of the basin was calculated at 550 kilograms/year.

In the years following the 1995 end of this project, stormwater-permitting requirements have been put forward by the U.S. EPA for larger communities. The Lake Superior stormwater project helped lay the foundation for stormwater planning and controls in Duluth, Minnesota, Superior, Wisconsin and Marquette, Michigan. U.S. EPA's next phase of stormwater regulations will extend requirements for erosion control and on-going stormwater management to industries and activities where over one acre of land is disturbed. While these new requirements will help the Lake Superior environment, they create a huge need for education. Following are several recent projects to address those needs.

- The Village of LaPointe, Wisconsin has a stormwater demonstration project at a commercial development near the Madeline Island waterfront funded by Wisconsin Coastal Management.
- The U.S. Army Corps of Engineers is proposing to provide environmental assistance to the City of Two Harbors, MN to construct a 2.5 million gallon stormwater detention basin at their wastewater treatment plant. Currently,

untreated sewage is dumped into Lake Superior during overflow storm events. Pending approval from the MPCA, plans are to have the system operational by Dec. 2004. The basin is being designed to contain up to a 25-year storm event and the estimated cost in excess of \$US 2 million.

- Recent Minnesota Pollution Control Agency enforcement actions were responsible for two stormwater projects, including Lutsen Mountain Inc. installing erosion control measures on steep slopes and Lake County installing a storm water basin in Two Harbors for flood and pollutant control on Skunk Creek.



- The Minnesota Coastal Program granted \$350,000 to Cook County to complete flooding and erosion control projects in the Grand Marais area, including erosion control and restoration on Village Creek and in the Creechville area.
- The Northland Nonpoint Education for Municipal Officials (NEMO) network serves as a way to coordinate watershed and stormwater education in the basin. Partners include University of Wisconsin – Lake Superior Research Institute and Minnesota Sea Grant.
- Wisconsin Department of Natural Resources and University of Wisconsin-Lake Superior Research Institute have a watershed education and stormwater outreach project to reach local officials and developers on the reasons for stormwater management to protect Lake Superior watersheds and fisheries (funded by WI Great Lakes Protection Fund).
- Superior, Wisconsin has a stormwater planning and education project. The local schools participate in educational events and have stenciled storm sewer covers with the message “Dump No Waste- Drains to Lake.” The City also offers assistance to local homeowners for water management and has set up demonstration rain gardens and rain barrels. Wisconsin Great Lakes Protection Fund and the Great Lakes Commission have funded this work. The City is seeking funding for stormwater retention and treatment basins.
- The Minnesota Coastal Program granted \$84,000 to the Lake County Forestry Department to develop methods of forest management that improve water quality in nearby streams. Projects include northern hardwoods management and conifer restoration.

- The Minnesota Pollution Control Agency annually participates in the Arrowhead Builder's Association's continuing education workshops and the Associated General Contractor's Duluth Safety Day by providing proper stormwater management information to attendees.
- The Minnesota Pollution Control Agency helped form the Regional Stormwater Protection Team and now actively participates as a member. The Team's mission is to protect and enhance the region's shared water resources through stormwater pollution prevention by providing coordinated educational programs and technical assistance. Members include; the City of Duluth, City of Hermantown, City of Proctor, Duluth Township, Midway Township, Rice Lake Township, UMD, St. Louis County, MnDOT, City of Superior and the South St. Louis Soil and Water Conservation District.

4.3 PUBLICATIONS LIST

Partners in the Lake Superior Binational Program have produced a variety of recent publications concerning zero discharge chemicals. They range from open burning videos to proceedings from the *Mercury in Our Lives* workshop to various posters, flyers, cards and reports. Appendix C lists these new source materials, along with contact information.

4.4 LaMP CHEMICAL MILESTONE REPORT

The chemical milestone report will serve as a comprehensive update and revision of the LaMP 2000 report (formerly Stage 3 LaMP) for Lake Superior critical chemicals. As set in the LaMP Stage 2, 2005 is a milestone year for the Lake Superior load reduction schedules for both the PCBs and dioxin. Using 1990 as a baseline year, the LaMP Stage 2 targets a 60% reduction for PCBs and an 80% reduction for dioxin, HCB and OCS in 2005. The Lake Superior Chemical Committee will assess progress towards these targets in the LaMP Chemical Milestone Report. Progress may be difficult to report given the weakness of the inventories for PCBs and dioxin. The committee will also update the mercury inventory and assess pesticide collections, although neither has a 2005 target. In attempting to meet milestones, the Chemical Committee is developing new indicators to measure success.

Another significant part of the report will be the evaluation of the LaMP 2000 strategies (Table 2) and associated reduction activities together with recommendations to update them. This work will be conducted with the assistance of the Lake Superior Binational Forum. In addition, the committee will examine the status of emerging chemicals and their relevance to the Lake Superior basin.

The sustainability theme will not be neglected in the 2005 milestone report. For example, although closures of industrial facilities eliminate discharges and emissions to the environment, the social and economic consequences to small communities are often of major proportions. In addition, the purchasing decisions and behavioral changes of

citizens together with municipal or county level policies are key to ensuring progress to zero discharge.

Appendix A. Contaminant Trends in Lake Superior Herring Gull Eggs 1974-2002⁴

Herring Gull eggs have been collected and analyzed annually from the same two Lake Superior sites since 1974. Current (2002) concentrations of Zero Discharge pollutants from the Agawa Rocks and Granite Island sites ranged as follows (all values are wet weight): PCBs as 1:1, Aroclor 1254:1260, (6.07 – 6.59 ug/g), PCBs as sum of congeners, (2.88 – 3.22 ug/g), chlordane (0.0766 – 0.0826 ug/g), DDE (1.13 – 1.23 ug/g), dieldrin (0.027 – 0.040 ug/g), HCB (0.009 – 0.010 ug/g), TCDD (3.38 – 4.26 pg/g) and mercury (0.163 – 0.167 ug/g). For the Lakewide critical pollutant heptachlor epoxide the range was 0.022 – 0.026 ug/g, and for the Prevention pollutant mirex the range was 0.020 – 0.021 ug/g.

The annual data from both sites, 1974-2002, were analyzed by change point regression (Pekarik and Weseloh 1998). Figure 1 illustrates trends in selected pesticides. At Agawa Rocks, total chlordanes have declined by 66.8% from 1987 to 2002. At Granite Island, total chlordanes have declined by 78.0% from 1987 to 2002. At both sites, dieldrin and heptachlor epoxide were declining faster now than they did earlier in the study. (See paragraph below for a further discussion of these two chemicals.) DDE and PCBs have declined at a constant rate throughout the study at Granite Island but their rates of decline have slowed in recent years at Agawa Rocks. HCB and mirex showed just the opposite pattern; they have declined at a constant rate at Agawa Rocks but declined more slowly in recent years at Granite Island. TCDD has declined faster recently at Agawa but shows no trend at Granite. In summary, 64.3% of contaminant-colony comparisons are declining as fast as or faster now than they were earlier in the study, while 28.6% have declined more slowly in recent years.

In terms of spatial patterns among the 15 Herring Gull Annual Monitoring sites from throughout the Great Lakes, data for 1998-2002 show that for dieldrin and heptachlor epoxide, gull eggs from both Granite Island and Agawa Rocks were among the most contaminated sites, ranking 3rd and 4th most contaminated, respectively, for each (Figure 2). For most other compounds, DDE, HCB, mirex, PCBs, TCDD and Hg values from the two sites did not differ from sites whose values were in the lower half of the overall range.

⁴ Canadian Wildlife Service, Environment Canada.

Fig 1a. Dieldrin in Herring Gull eggs, Agawa Rks., 1974-2002

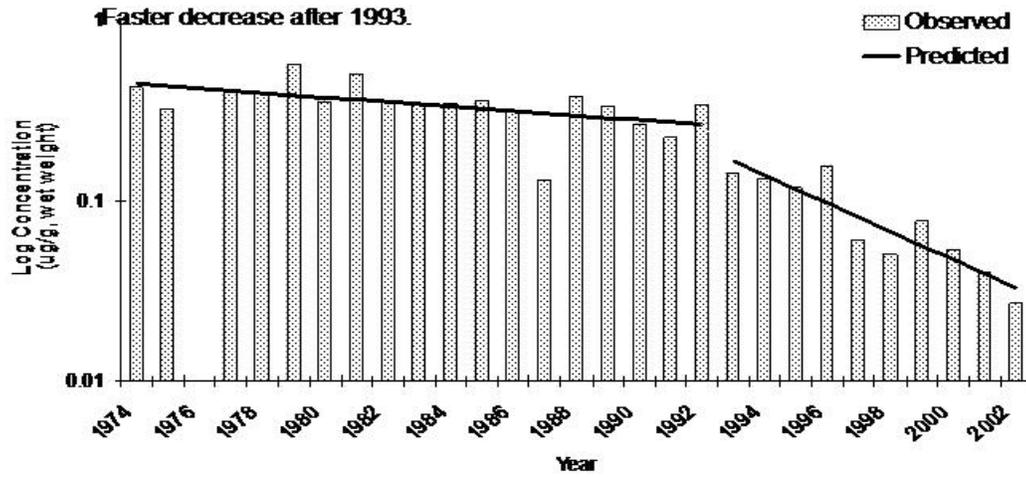


Fig 1b. Heptachlor epoxide in Herring Gull eggs, Granite I., 1974-2002

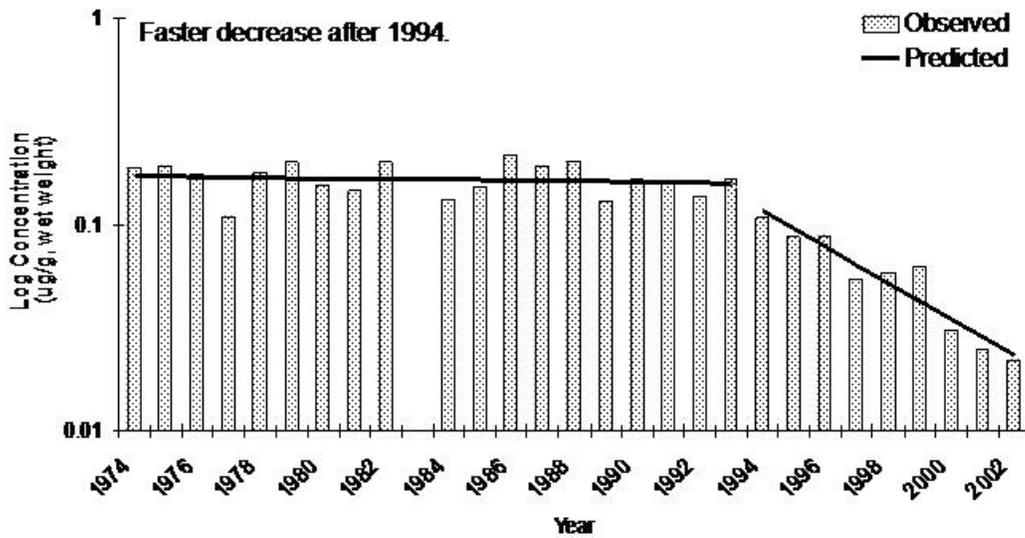
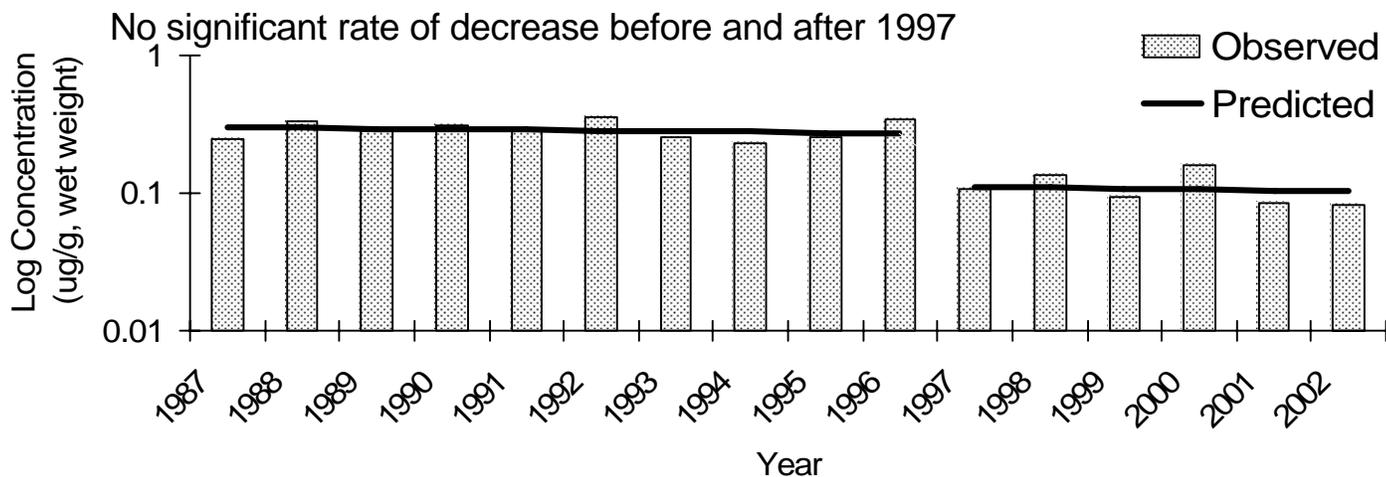


Fig 1c. Total chlordanes* in Herring Gull eggs, Agawa Rocks, 1987-2002

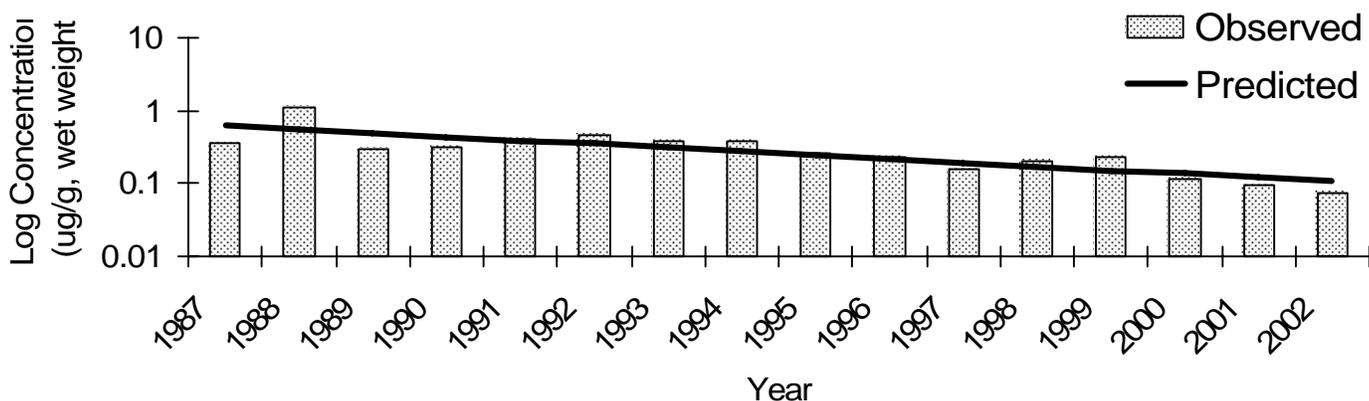
*Total chlordanes = oxychlordanes, cis-chlordanes, transchlordanes, cis-nonachlor and transnonachlor



The average concentration of total chlordanes from 1987-2002 was 0.2219 ug/g of which 55.3% was oxychlordanes, 22.0% was transnonachlor, 20.4% was cisnonachlor, 2.2% was cischlordanes and 0.1% was transchlordanes.

Fig 1d. Total chlordanes* in Herring Gull eggs, Granite I., 1987-2002

*Total chlordanes = oxychlordanes, cis-chlordanes, transchlordanes, cis-nonachlor and transnonachlor



The average concentration of total chlordanes from 1987-2002 was 0.3220 ug/g of which 43.5% was oxychlordanes, 35.9% was transnonachlor, 18.0% was cis-nonachlor, 2.3% was cis-chlordanes and 0.3% was transchlordanes.

Figure 2a. Spatial patterns for mean dieldrin (\pm S.D.) values, 1998-2002, among the 15 Herring Gull Annual Monitor Colonies. Means with the same letter are not significantly different (SNK test).

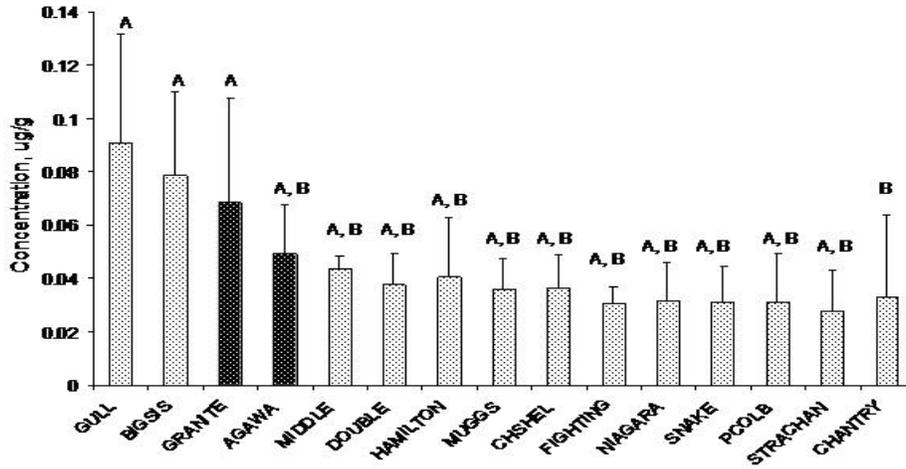
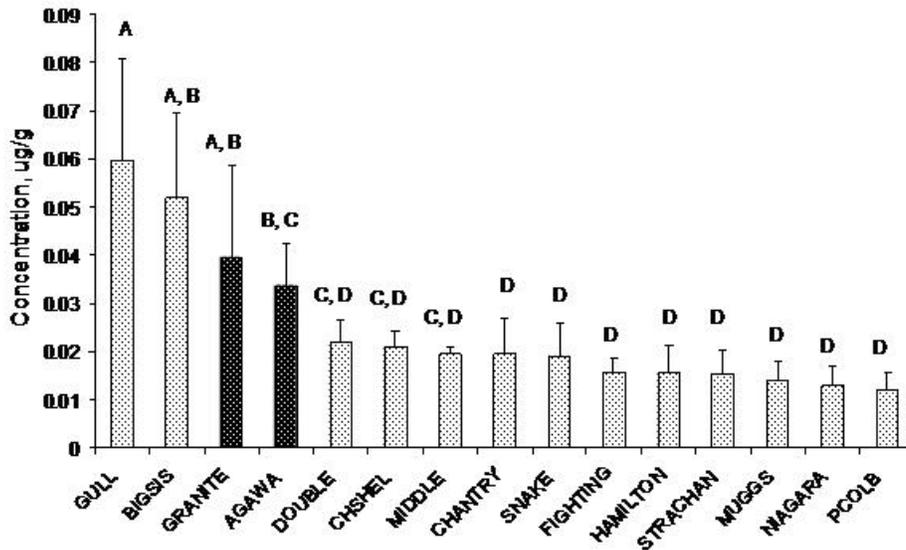


Figure 2b. Spatial patterns for mean heptachlor epoxide (\pm S.D.) values, 1998-2002, among the 15 Herring Gull Annual Monitor Colonies. Means with the same letter are not significantly different (SNK test).



Appendix B. Lake Superior Forum Chemical Committee 2003 Activities

Joint Projects with Lake Superior Workgroup agencies:

- The committee undertook the following three joint projects: mercury outreach, burn barrel outreach and abandoned white goods.
- The effects of mercury on human health and mercury source awareness are potential future joint projects.

Mercury Issues/Mercury Workshop, June 2003

- The committee provided strategic advice and support on mercury outreach; assisted in organizing the mercury workshop in Thunder Bay.
- The committee sent a letter to the Binational Executive Committee (BEC) requesting an update on BEC's advocacy role for regulatory actions to achieve mercury load reduction targets for Lake Superior.
- As a follow up to the mercury workshop, the committee will pursue ideas on how to implement mercury bans in local communities and institutions including schools, universities/colleges and hospitals.
- The committee drafted a letter to Lakehead University and Confederation College asking how they deal with mercury from their laboratories and to identify mercury problems around campus.

Mining

- Newmont Mining requests Forum feedback on the "Toward Sustainable Mining" (TSM) initiative of the Mining Association Canada (MAC). A subcommittee was formed to review and comment on the initiative.
- The committee drafted a letter of approval to Newmont Mining for the TSM initiative and asked to be allowed to review and provide input into further documents.

LaMP-related activities

- The committee and SWG agreed to hold a monthly conference call and a yearly joint meeting to assess the progress of goals set for the reduction of critical pollutants and additional chemicals.

Contacts: Barb Nicol (Canada) barb.nicol@lakeheadu.ca
Lissa Radke (U.S.) lradke@northland.edu

Appendix C. Publications and Outreach Materials Associated with the Lake Superior LaMP: 2002 and 2004

Air Defenders: teaching kit on burn barrels and respiratory disease developed by Wisconsin Environmental Health Association and Wisconsin Department of Natural Resources. Contact: Lindsay Haas, www.airdefenders.org

Burn Barrels: Unhealthy, Unneighborly, Unnecessary and Illegal: Burn barrel education leaflet produced by University of Wisconsin – Extension. Contact: David Liebl

Burning Garbage EcoNews: Radio and Television advertising running in segments on Thunder Bay outlets from September 2002 to March 2004.

Burning Garbage Makes Poison: Poster produced by EcoSuperior and Environment Canada. Contact: Jane Oldale, www.ecosuperior.com/openburning.html

Burning Household Garbage: Impacts and Alternatives: Workshop Summary April 2002. Contains workshop conclusions, breakout session Questions and Answers, speakers slides. Contact: Barb Nicol,

Burning Household Garbage outreach: materials produced by EcoSuperior to date: tax bill inserts; woodstove retailer tags; and (in parks) campfire flyers, tags for firewood bundles, and garbage/litter bags. Contact: Jane Oldale www.ecosuperior.com/openburning.html

Dental Wastes Best Management Practices guide for the dental community: prepared by the Royal College of Dental Surgeons of Ontario. www.rcdso.org/pdf/dental_wastes/dental_amalgam_mercury.pdf

Don't Burn Trash at Your Campsite: a card for distribution at campsites produced by the Minnesota Pollution Control Agency with assistance from other agencies. Contact: Carri Lohse-Hanson

Fish Contaminant Monitoring Program Report: Report from Michigan Department of Environmental Quality shows that contaminant concentrations declined between 1991 and 2001 in Lake Superior lake trout. Contact: Bob Day

An Historical Overview of Mercury: Lake Superior Perspective: Poster produced by the Lake Superior Binational Program Chemical Committee for the IJC mercury workshop that documents mercury reductions since 1990. Contact: Patrick Morash

Lake Superior 2004: A Year of Protecting the Greatest of Lakes: Calendar produced by St. Louis River Citizens Action Committee, Minnesota Pollution Control Agency, Wisconsin Department of Natural Resources and other partners. Paper supplied by Sappi Fine Papers. Contacts: Carri Lohse-Hanson and Nancy Larson

Lake Superior Basin Plan: Examining the Health of Watersheds (draft): Report defines goals and strategies for water resource management for the Minnesota portion of

the basin, produced by the Minnesota Pollution Control Agency. Contact: Brian Fredrickson

Mercury in Our Lives: A Workshop on Mercury Reduction for the Lake Superior Community: Speakers' slides and proceedings from a workshop held in June 2003. Contact: Barb Nicol

Mercury Reductions via Public/Consumer Outreach: A report produced for the St. Louis River Watershed TMDL Pilot Project by Barr Engineering. Contact: Paula Jackson

Mercury Use Tree: Sources and Common Uses: An updated poster version of the Stage 2 use tree produced by the Minnesota Pollution Control Agency. Contact: Carri Lohse-Hanson

Open Burning: A survey to assess health, environmental, legal, enforcement and safety issues concerning open burning in our region: Survey of local units of government in portions of Minnesota, Wisconsin and Michigan regarding health, environmental, legal, enforcement and safety concerns related to open burning of household trash. Produced by Western Lake Superior Sanitary District. Contact: Doug Fairchild

Open Burning And Backyard Dumping: Report and Recommendations of the Stakeholder Steering Group: Report from Wisconsin stakeholders presented to Wisconsin Natural Resources Board. Contact: Kevin Kessler

PCB Use Tree: Sources and Common Uses: An updated poster version of the Stage 2 use tree produced by the Minnesota Pollution Control Agency. Contact: Carri Lohse-Hanson

re: amalgam recovery: Booklet for dentists produced by Minnesota Dental Association and the Metropolitan Council. Contact: Loren Hanson

Review of the Status and Trends of Lake Superior Environmental Chemical Contamination in Air, Water, and Selected Biota: Summary of chemical contamination in Lake Superior produced for the Great Lakes Fishery Commission-State of Lake Superior Conference. Contact: Kory Groetsch

Teamwork on Wisconsin's North Coast: Sixteen page article in Wisconsin Natural Resources magazine. Contact: Nancy Larson

We at the MPCA have a nose for trouble: Bookmark showing Clancy the mercury detecting dog produced as part of the Mercury Free Zone project by the Minnesota Pollution Control Agency. Contact: Chris Butler

What Goes Up, Must Come Down. Poster produced by Environment Canada and EcoSuperior on the effects of burning garbage. Contact: Bruce Gillies

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